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㊵交直連系系統の制御方式

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明　細　書

発明の名称　交直連系系統の制御方式

特許請求の範囲

1. 1台または複数台の発電設備及び与えられた発電々力設定値に従つて発電々力を制御するための制御装置を備えた発電所、その発電所と消費地を結び、与えられた送電々力設定値に従つて送電々力を制御するための制御装置を備えた直流送電系統により構成される発送電システムにおいて、発電々力設定値を与えるための第1の設定手段、発電機の周波数を検出するための第1の周波数検出手段、発電機の周波数の設定値を与えるための第2の設定手段、前記第1の周波数検出手段と第2の設定手段の出力の差を求めるための第1の差検出手段、第1の設定手段の出力を受け、その値を第1の差検出手段の出力によつて補正する第1の補正手段を備え、その第1の補正手段の出力をもつて、直流送電系統の送電々力設定値とすることを特徴とする交直連系系統の制御方式。

2. 直流送電系統の受電側の交流系統の周波数を検出する第2の周波数検出手段、受電側交流系統の周波数の設定値を与えるための第3の設定手段、前記第2の周波数検出手段と第3の設定手段の出力の差を求める第2の差検出手段、第1の設定手段の出力を受け、その値を第2の差検出手段の出力によつて補正する第2の補正手段を備え、その第2の補正手段の出力をもつて、発電々力設定値とすることを特徴とする特許請求範囲第1項記載の交直連系系統の制御方式。

3. 第2の差検出手段の出力を不感帯を有する第1の非線形変換手段を介して、第2の補正手段に加えることを特徴とする特許請求範囲第2項記載の交直連系系統の制御方式。

4. 直流送電系統の受電側の交流系統の周波数を検出する第2の周波数検出手段、第1の周波数検出手段と第2の周波数検出手段の差を求める第3の差検出手段、第1の設定手段の出力を受け、その値を第3の差検出手段の出力によつて補正する第3の補正手段を備え、その第3の補

正手段の出力をもつて発電々力設定値とすることを特徴とする特許請求範囲第1項記載の交直連系々統の制御方式。

5. 第3の差検出手段の出力を不感帯を有する第2の非線形変換手段を介して、第3の補正手段に加えることを特徴とする特許請求範囲第4項記載の交直連系々統の制御方式。

6. 第2あるいは第3の差検出手段の出力によつて、第2の設定手段の出力を補正するための第3の補正手段を備えることを特徴とする特許請求範囲第2項〜第5項記載の交直連系々統の制御方式。

7. 発電所内及び周辺の負荷の量を測定あるいは見積る手段、その手段の出力を第1の設定手段の出力から減ずる減算手段を備え、その減算手段の出力を第1の補正手段の入力として与えることを特徴とする特許請求範囲第1項〜第6項記載の交直連系々統の制御方式。

発明の詳細な説明

本発明は、交直連系々統の制御方式に係り、特に、発電所の全出力あるいは出力の大部分を直流送電によつて消費地に送電する場合の発電所と直流送電系統の協調をとるのに好適な制御方式に関する。

発電所の全出力あるいは出力の大部分を直流送電によつて送電する場合発電々力と直流送電々力のバランスをとること、及び発電機の周波数を一定に保つことが必要である。この様な要求に対して従来は、発電々力の制御はボイラ、タービン等の制御により、周波数の制御はガバナによつて行なつていた。また、直流送電系統は、発電所との電力のバランスがとれる様に制御するわけであるが、そのために、発電々力設定値と等しい値を与えて直流送電々力設定値とする他、電源側と受電側の交流系統の周波数差をとり、その差が零になる方向に、即ち発電側の周波数の方が低い場合には直流送電々力を増加させ、逆の場合は減少させる様に直流送電々力を補正することにより電力のバランスをとる制御が行われる。

しかしながら、上記の様な制御方式をとると、発電機ガバナと直流送電系統の制御が干渉し合う恐れがある。また、原子力発電所の様にガバナの動作を制限している発電所からの直流送電の場合には、この様な制御方式は適用できない。

本発明の目的は、発電所と直流送電系統の協調をとり安定な送電を行うための制御方式を提供するところにある。

本発明は、原子力や火力発電所等の応答速度が高々30%／分であるのに対し、直流送電系統では500%／秒以上の高速反応が可能である点に着目してなされたもので、発電所の発電々力を優先的に設定し、直流送電系統の送電々力をそれに追随させることによつて、電力のバランスをとり、発電機の周波数を安定化するもので、発電機のガバナは必要としない。

基本的には、直流送電系統の送電々力設定値として、発電所の発電々力設定値と同じ値を与え、発電機の周波数が規定値からずれた場合には、その周波数偏差によつて送電々力設定値を補正することにより、発電々力と送電々力のバランスを保ち周波数を一定に保つように制御する。

第1図に本発明の実施例を示す。

図において、PSは発電所、Gはボイラ、タービン、発電機等を含めた発電設備、PCは発電々力を制御するための発電所制御装置、DSは直流送電系統、Cは変換装置、DCは送電々力を制御するための直流系統制御装置、B_s，B_rはそれぞれ送電側、受電側の母線、ANは受電側交流系統である。以上が、発明の適用対象となる交直連系々統である。

つぎに、発明の基本部分をなす構成要素について説明する。

S_1は発電々力設定値を与えるための第1の設定手段、S_2は発電機周波数を設定するための第2の設定手段、PD_1は発電機の周波数を検出するための第1の周波数検出手段、DF_1は発電機の周波数設定値と周波数検出値の差を求めるための第1の差検出手段、CO_1は直流送電系統の送電々力設定値を補正するための第1の補正手段であるが、ここではCO_1、DF_1としていずれも

加減器を用いる場合の実施例を示している。

以上の基本部分による基本制御部の動作をつぎに説明する。なお、ここではあとで説明する第2の補正手段CO_2又はCO_2及びCO_3はいずれも挿入されていないものとし、S_1の出力が直接PC及びCO_1に加えられ、S_2の出力は直接DF_1に加えられるものとして説明する。

まず、発電機の周波数が設定値に等しい場合についてみると、DF_1の出力は零であり、PCとDCに同じ電力設定値が与えられ、制御装置の誤差が無ければ、発電々力と送電々力は等しくなる。ところが、現実には、制御装置には誤差が存在する制御系の発電設備の違いによる発電電力と送電電力の違いも存在する。またし、発電所から直流送電系統までの間の送電線による損失も存在するので、これだけでは電力のバランスは取れない。したがつて周波数が設定値からずれてくる訳であるが、その場合はFD_1の出力とS_2の出力の間に差が生じ、DF_1に出力が現われる。今、周波数が設定値よりも上昇した場合を考えると、DF_1の出力として＋の信号が現われ、これがCO_1により送電々力設定値に加算されるから、直流送電々力は増加し、発電機の出力が増加するために周波数は低下する。逆に、周波数が設定値よりも低下した場合には、直流送電々力が減少し、周波数を上昇させる。このようにして、発電機の周波数は設定値に等しい一定値に保たれ、安定な運転が行なわれる。先に述べた様に発電所の発電々力変更速度が高々30%／分であるのに対して、直流送電系統の応答速度は、500%／秒と3桁程も速いので、発電々力設定値が変更され、発電々力が変化する場合でも、周波数を一定に保つ直流送電系統の制御は十分に追随でき発電々力と送電々力のバランスが取れた安定な運転が可能となる。

以上の様に本発明によると、発電所のガバナを用いることなく、発電所の全電力あるいは大部分の電力を直流送電により送電する交直連系々統の安定な運転を実現することができる。

以上、本発明の基本部分について説明したが、本発明では負荷側からの要求に応じた制御をも行うことができる。第1図によつてこの制御を説明する。同図中でFD_2は受電側即ち負荷側の周波数を検出するための第2の周波数検出手段、S_3は受電側交流系統の周波数設定値を与えるための第3の設定手段、DF_2は、FD_2出力とS_3出力の差を検出するための第2の差検出手段、NLは、DF_2の出力が規定値以上となつた場合にのみ出力を発生する非線形変換手段、CO_2，CO_2'は、NLの出力によつて、発電々力設定値を補正するための第2の補正手段、LはNL出力の最大振幅を抑えるためのリミッタ、CO_3は、発電機周波数設定値をLの出力によつて補正するための第3の補正手段である。

CO_2とCO_2'はいずれか一方のみを使用するが、ここでは先ずCO_2を使用する場合の動作を説明する。またCO_3を除き、S_2の出力が直接DF_1に加えられるものとして負荷側の要求に応じた制御の基本部分を説明する。

いま、受電側の交流系統で事故が発生し、電力不足となつて、周波数が低下すると、DF_2に＋の出力が現われる。これが規定値以上になると、NLに出力が表われ、それが発電々力設定値に加算されてPCに与えられる。即ち、受電側交流系統の周波数が規定値以上に低下すると、それに応じて発電々力が増加して来る。そうすると、発電機の周波数が増加しようとするので、それに応じて、先に説明したFD_1，DF_1，CO_1が働き、周波数を一定に保ちつつ直流送電々力を増加させる。

この様に、本発明によると、負荷側の状態に対応した制御が安定に行われる。第2の補正手段としてCO_2の代りにCO_2'を用いても、同様な性能を得ることができる。

以上の発明では発電機の周波数を常に一定に保つ様に制御している。これは、発電所の出力変更の速度が遅いために急速な制御はできないので、この出力変更速度に応じた制御を行おうとするものである。しかしながら、緊急時の制御を考えると、発電機及びタービンの回転エネルギーとして蓄えられたエネルギーを放出することによつて、短時間ではあるが、送電々力を急速に増加させる

ことができれば、発電側交流系統の過渡安定上向上に資するところが大きい。L及びCO_2はこの様な機能を持たせるための追加回路である。NLに＋の信号が現われると、それがリミッタLを介してCO_2に加わり、周波数の設定値を低下させる。そうすると、DF_1に＋の出力が現われ直流送電系統の送電々力設定値を増加させる。このとき、発電出力と送電出力が一時的にアンバランスになり、発電機の周波数は低下してくるが、FD_1出力がCO_2の出力に等しくなるまでは、回転エネルギーとして蓄えられたエネルギーを放出しつつ送電々力の増加を維持することができる。なお、リミッタLは、周波数設定値の変更幅を規定値以下に抑えるために設ける。これは、発電所機器には、安全に運転できる周波数の範囲が定められているためである。

以上の説明は、受電側交流系統の周波数が低下した場合について行つたが、周波数が上昇した場合も逆の動きにより、受電側交流系統の変動に応じた制御が可能である。

第2図は受電側交流系統の変動に対応する制御の他の実施例を示す。図中に第1図と同じ記号を示すものは、第1図で説明したものと同じものを示す。第2図では、FD_1とFD_2の出力の差を求めるための差検出手段DF_2を用いているところが異なる。この場合も、例えば受電側交流系統の周波数が低下すると、DF_2に十の出力が現われるので、第1図の場合と同様に、発電々力及び送電々力を増加させることができる。

第3図は本発明の他の実施例を示す。同図で、第1図と同じ記号で示すものは、第1図と同じものを示す。第3図中で、LLは発電所構内あるいは近辺にある負荷、LDはその負荷の電力を測定するための手段、SUは発電々力設定値から負荷LLの電力値即ちLD出力を差引くための減算手段であり、このSU出力をCO_1に加える。実際の系統ではこのように負荷が存在するのが普通であるから、第3図によると、この負荷による電力消費分を考慮に入れたより精度の高い制御が可能となる。第1図や第2図の実施例では、このような負荷による発電々力と送電々力の差は、発電機の周波数を一定に保つ制御ループによつて、送電々力を変更することによつて対処しているわけであるが、第3図のように予め負荷の分を考慮した制御を行えばより高精度の制御が可能となる。なお、第3図では、負荷電力の測定値を用いてS_1の出力を補正してCO_1に加える例を示したが、実際に負荷電力を測定するのではなく、負荷の接続状況により負荷の電力を見積つて、その値をSUに加えても同様の効果が得られる。

以上に説明した様に本発明によれば、発電所と直流送電系統の協調をとつた制御が可能となり、更に、受電側の交流系統の状況に応じた制御も可能となる。

図面の簡単な説明

第1図は本発明の実施例を示すための図面、第2図、第3図は本発明の変形例を示すための図面である。

PS…発電所、PC…発電所制御装置、DS…直流送電系統、AN…受電側交流系統、C…変換装置、DC…直流系統制御装置、CO…補正手段、DF…差検出手段、FD…周波数検出手段。

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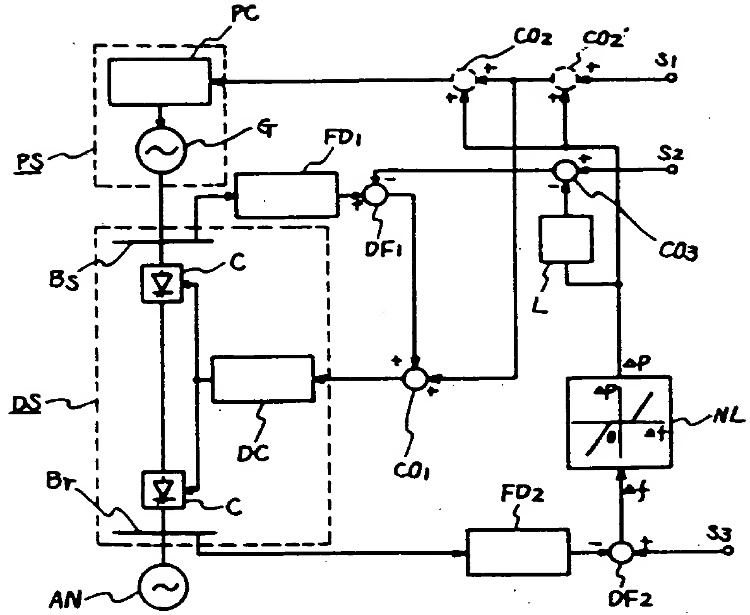
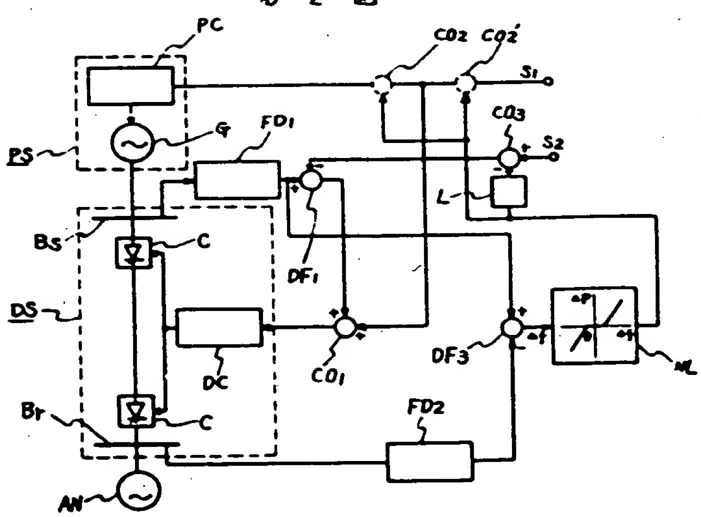
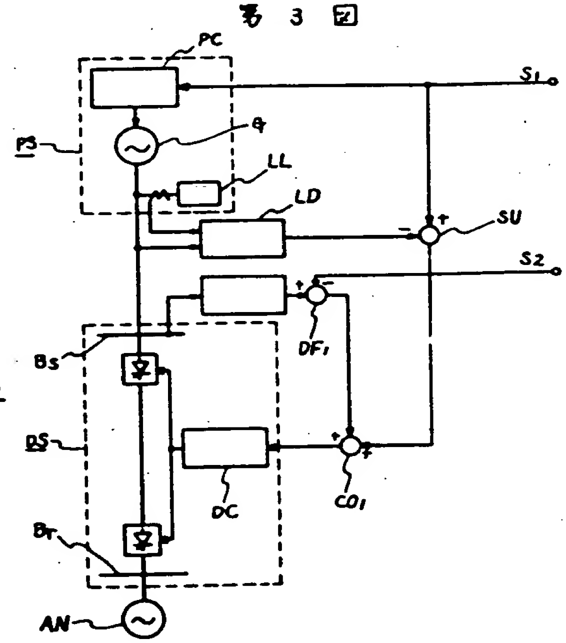
第1図


PC
CO2
CO2'
S1
G
PS
FD1
S2
DF1
CO3
Bs
C
L
ΔP
DS
DC
NL
Δf
CO1
Br
C
FD2
S3
AN
DF2

第2図


PC
CO2
CO2'
S1
G
FD1
CO3
S2
PS
L
Bs
C
DF1
DS
CO1
DF3
NL
DC
Br
C
FD2
AN

第3図


PC
S1
G
PS
LL
LD
SU
S2
DF1
Bs
DS
DC
CO1
Br
AN

JAPANESE LAID OPEN PATENT NUMBER: 56-112828.

54 CONTROL METHOD FOR AC/DC ALIGNED SYSTEM.

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TITLE OF INVENTION: CONTROL SYSTEM FOR AC/DC ALIGNED SYSTEM.

[SCOPE OF THE CLAIM]

1. In a generated electric power transfer system configured by the DC transferred electric power system having: an electric power plant having a control apparatus for controlling a generated electric power with respect to at least a generated electric power facility and a given generated electric power setting parameter; and a control apparatus for connecting the electric power plant with an electric power consuming place and controlling a transferred electric power with respect to a given transferred electric power setting parameter, a control system of an AC/DC aligned system for setting an output of a first compensation means as a transferred electric power setting parameter of the DC transferred electric power system, comprising:

a first setting means for giving a generated electric power setting parameter;

a first frequency detection means for detecting a frequency of an electric power generator;

a second setting means for giving a frequency setting parameter of the electric power generator;

a first differential detection means for acquiring an output difference between said first frequency detection means and said second setting means;

a first compensation means for receiving an output of said first setting means and compensating the output value by an output of said first differential detection means; and

being a transferred electric power setting parameter of the DC transferred electric power system with the output of said first compensation means.

2. The control system of claim 1, wherein the control system of the AC/DC aligned system has:

a second frequency detection means for detecting a frequency of an AC electric power system on the side of receiving an electric power of the DC transferred electric power system;

a third setting means for giving a frequency setting parameter of an AC electric power system on the side of receiving an electric power;

a second differential detection means for acquiring an output difference between said second frequency detection means and said third setting means; and

a second compensation means for receiving an output of said first setting means and compensating the output value by an output of said second differential detection means

being a generated electric power setting parameter with the output of said second compensation means.

3. The control system of claim 2, wherein the control system of the AC/DC aligned system adds the output of said second differential detection means to said second compensation means via a first non-linear conversion means having a blind zone.

4. The control system of claim 1, wherein the control system of the AC/DC aligned system has:

said second frequency detection means for detecting a frequency of the AC electric power system on the side of receiving an electric power of the DC transferred electric power system;

a third differential detection means for acquiring the difference between said first frequency detection means and said second frequency detection means;

a third compensation means for receiving an output of said first setting means and compensating the output by an output of said third differential detection means; and

being a generated electric power setting parameter with an output of said third compensation means.

5. The control system of claim 4, wherein the control system of the AC/DC aligned system adds the output of said third differential detection means to said third compensation means via a second non-linear conversion means having a blind zone.

6. The control system of claims 2 through 5, wherein the control system of the AC/DC aligned system has said third compensation means for compensating the output of said second setting means by the output of said second differential detection means or said third differential detection means.

7. The control system of claims 1 through 6, wherein the control system of the AC/DC aligned system has a means for measuring or estimating an amount of the load in a generated electric power plant and its surrounding, has a subtraction means for subtracting an output of said means for measuring or estimating from the output of said first setting means and an output of said subtraction means is given as an input of said first compensation means.

Description of the detailed invention.

The present invention relates to control system for AC/DC aligned system. In particular, the invention relates to an optimum control system for coordinating the power plant with the DC transferred electric power system where total output of the power plant or a major part of the output are transferred

to an electric power consumption location by the DC transferred electric power.

When the total output of the power plant or a major part of the output are transferred by the DC transferred electric power, it is necessary to take a balance between a generated electric power and the DC transferred electric power and to keep constant a frequency of an electric power generator. Therefore, in the conventional art, a control of the generated electric power has been performed by a control of a boiler and turbine, and a control of a frequency is performed by a governor. Although the DC transferred electric power system controls so that the balance of an electric power with the power plant can be done, to maintain this balance, the DC transferred electric power setting parameter is determined by giving a value equal to the generated electric power setting parameter, a frequency difference of the AC electric power system between the side of an electric power supply and the side of receiving the electric power is taken and to the direction where the frequency difference becomes zero, that is, a control of taking a balance of an electric power is performed by compensating the DC transferred electric power so that when a frequency on the side of an electric power generation is lower, the DC transferred electric power is increased and when the frequency on the side of an electric power generation is higher, the DC transferred electric power is decreased.

However, if the above control system is taken, there is a problem that an electric power generator governor interferes with a control by the DC transferred electric power system. In the DC transferred electric power through a power plant, such as a nuclear power plant that restricts an operation of governor, the above mentioned control system can not be applied.

An object of the present invention is to coordinate a power plant with a DC transferred electric power system and to provide a control system for performing a stable electric power transfer.

The present invention is made by putting an eye on the point that a high speed response of more than 500% for a second is available in the DC transferred electric power system to a response speed of 30% for a minute in a nuclear power or a fire power plant. A balance of an electric power is taken and a frequency of an electric power generator is stabilized by setting a generated electric power of the power plant and following a transferred electric power of the DC transferred electric power system with the generated electric power. A governor of an electric power generator is not required.

Basically, the same value as a generated electric power setting parameter of the power plant is given as a transferred electric power setting parameter of the DC transferred electric power system and when a frequency of an electric

power generator is drifted from a normalized value, the electric power system is controlled so that a balance between a generated electric power and a transferred electric power is kept and a frequency is kept constant by compensating the transferred electric power setting parameter through a frequency deviation of the electric power generator.

Figure 1 shows an embodiment of the present invention. In this figure, PS is a power plant, G is a generated electric power facility including a boiler, a turbine or an electric power generator, PC is a power plant control apparatus for controlling a generated electric power, DS is a DC transferred electric power system, C is a converter, DC is a DC power system control apparatus for controlling a transferred electric power, Bs and Br are respectively basic wiring line on the side of an electric transfer and on the side of receiving an electric power, AN is an AC power system on the side of receiving an electric power.

There is a description of elements configured a basic part of the invention. S1 is a first setting means for giving a generated electric power setting parameter, S2 is a second setting means for setting a frequency of an electric power generator, FD1 is a first frequency detection means for detecting a frequency of an electric power generator, DF1 is a first differential detection means for acquiring a difference between a frequency setting parameter and a frequency detection parameter of an electric power generator and CO1 is

a first compensation means for compensating a transferred electric power setting parameter of the DC transferred electric power system. An example embodiment of using an adder as the CO1 and DF1 is indicated.

There is a description of an operation for a basic control part based on the above basic part. In this operation, either one of a second compensation means CO2 or CO2 and CO3 are not inserted, an output of the S1 is directly added to the PC and CO1 and an output of S2 is added directly to DF1.

Considering that a frequency of an electric power generator is equal to a setting parameter, an output of the DF1 is zero, an identical electric power setting parameter is given to the PC and DC and when there is no error in the control apparatus, a generated electric power becomes equal to a transferred electric power. However, in a real life, there is an error in the control apparatus and there exists a difference between a generated electric power and a transferred electric power based on the difference of a response speed in the control system. Further, because there exists a loss based on a transferred electric wiring between a power plant and the DC transferred electric power system, a balance of an electric power can not be maintained. Accordingly, a frequency is drifted from the setting parameter. However, in that case, there occurs a difference between an output of the FD1 and an output of the S2 and there

appears an output to the DF1. Considering if a frequency increases more than a setting parameter, there appears a positive signal as the output of the DF1 and since this positive signal is added to the transferred electric power setting parameter by CO1, the DC transferred electric power is increased and a frequency is going down because an output of an electric power generator is increased. On the contrary, when the frequency is going down more than the setting parameter, the DC transferred electric power is decreased and the frequency is increased. Then, a frequency of an electric power generator is kept a constant value equal to the setting parameter and a stable operation is performed.

As an aforementioned above, because a response speed of the DC transferred electric power system is 500% for a second to a 30% for a minute of a generated electric power change speed in a power plant, even when the generated electric power setting parameter is changed and a generated electric power is changed, a control of the DC transferred electric power system for keeping a frequency constant can be followed and it is possible to perform a stable operation having a good balance between a generated electric power and a transferred electric power.

With respect to the present invention, a stable operation of an AC/DC aligned power system for transferring total electric power of the power plant or its major part through

the DC transferred electric power without using a governor of a power plant can be realized.

Although the basic part of the present invention has been described, a control in response to a request from the side of load can be performed in the invention. By using Figure 1, this control is described. In this figure, FD2 is a second frequency detection means for detecting a frequency on the side of receiving an electric power, that is, on the side of load, S3 is a third setting means for giving a frequency setting parameter in the AC power system on the side of receiving an electric power, DF2 is a second differential detection means for detecting a difference between FD2 output and S3 output, NL is a non-linear conversion means for generating an output only when an output of DF2 becomes beyond a normalized value, CO2 and CO2' are second compensation means for compensating a generated electric power setting parameter by an output of the NL, L is a limiter for restricting a maximum amplitude of NL output and CO3 is a third compensation means for compensating a frequency setting parameter of an electric power generator by an output of the L.

Although either one of CO2 and CO2' is used, an operation of using the CO2 is described. Assuming CO3 is removed and an output of S2 is added directly to DF1, a basic part of control in response to a request on the side of the load is described.

When there happens some failures in the AC power system on the side of receiving an electric power and a frequency is

decreased because of short of the power, a positive output appears in DF2. When this positive output becomes beyond a normalized value, an output appears in NL and the output is given to PC by adding the output to a generated electric power setting parameter. When a frequency of an AC electric power system on the side of receiving an electric power is decreased more than the normalized value, a generated electric power is increased in response to the frequency. Then, since a frequency of an electric power generator is increased, in response to that, FD1, DF1, CO1 are functioned and the DC transferred electric power is increased while the frequency is kept constant.

Based on the present invention, a stable control in response to a status on the side of load is performed. Even when CO2' is used instead of CO2 for the second compensation means, the same performance can be obtained.

In an aforementioned invention, a frequency of an electric power generator is controlled to be kept constant. Because a quick control can not be performed since an output change speed of the power plant is slow, a control in response to the output change speed is performed.

However, considering a control at the time of an emergency, if a transferred electric power can be increased promptly during a short period of time by discharging an energy stored as a rotation energy of an electric power generator and a turbine, that largely contributes to an

improvement of an extreme stability in the AC power system on the side of an electric power generation. L and CO3 are additional circuits for having the above function. When a positive signal is appeared in the NL, the signal is added via a limiter L to CO3 and a setting parameter of a frequency is decreased. Then, a positive output is appeared in DF1 and a transferred electric power setting parameter of the DC transferred electric power system is increased. At this moment, both a generated electric power output and a transferred electric power output become temporarily unbalance and a frequency of an electric power generator goes down. However, by the time FD1 output becomes equal to an output of CO3, an energy stored as a rotation energy is discharged and an increase of a transferred electric power can be maintained. Moreover, a limiter L is provided for restricting a change width of a frequency setting parameter below a normalized value. This is because a range of frequency being capable of operating safely is determined in the power plant facility.

Although the above description is given for decreasing a frequency of an AC power system on the side of receiving an electric power, even when the frequency goes up, it is possible to perform a control in response to the variation of the AC power system on the side of receiving an electric power through a reverse action.

Figure 2 shows another embodiment of control in response to the variation of the AC power system on the side of

receiving an electric power. Figure 2 that uses a differential detection means DF3 for acquiring an output difference between FD1 and FD2 is different from Figure 1.

For instance, when a frequency of the AC power system on the side of receiving an electric power is decreased, a positive output is appeared in DF3. Therefore, in a same manner as in Figure 1, a generated electric power and a transferred electric power can be increased.

Figure 3 shows still another embodiment of the invention. In Figure 3, LL is a load in the power plant or its surrounding, LD is a means for measuring a load electric power, SU is a subtraction means for subtracting an electric power value of a load LL (that is, a LD output) from a generated electric power setting parameter and this SU output is added to CO1. Since it is natural that there exists a load in an actual power system, based on Figure 3, it is possible to perform an accurate control that considers an electric power consumed by this load. In embodiments of Figures 1 and 2, a difference between a generated electric power and a transferred electric power through the load is covered by a control loop for keeping constant a frequency of an electric power generator and by changing a transferred electric power. However, if a control for considering in advance the load as in Figure 3 is performed, more accurate control is available.

Moreover, although Figure 3 shows an example for adding a compensated output of S1 using a measurement value of a load

power consumption to CO1, actually the load power consumption is not measured and the same effect is acquired even if a load power consumption is estimated with respect to the load connection status and the load power consumption is added to SU.

As an aforementioned above, based on the present invention, a control for coordinating the power plant with the DC transferred electric power system is available and a control in response to the status of an AC power system on the side of receiving an electric power is available.

Brief description of the drawings.

[Figure 1]

A circuit diagram showing an embodiment of the present invention.

[Figures 2 and 3]

Circuit diagrams showing a modified example of the present invention.

PS : Power plant, PC : Power plant control apparatus,

D3 : DC transferred electric power system, AN : AC power system on the side of receiving an electric power, C : converter, DC : DC power system control apparatus, CO : Compensation means, DF : Differential detection means, FD : frequency detection means.